

## **REMARKS**

Applicants respectfully request reconsideration and allowance of all pending claims.

### **I. Status of Pending Claims**

Claims 90-122 remain pending. Claims 90-95, 98-102, 106, 107, 113, 114, 116-119 and 122 are currently under consideration, while claims 96, 97, 103-105, 108-112, 115, 120 and 121 have been withdrawn from consideration at this time.

### **II. Claim Rejections under §103**

Applicants respectfully request reconsideration of the rejection of claims 90-95, 98-102, 106, 107, 113, 114 and 116-119, all of which were previously found allowable, under 35 U.S.C. §103 as being upatentable over Weinberg et al. (U.S. Pat. 6,030,917) and Johnson et al. (J. Am. Chem. Soc., **1995**, 117(23), pp. 6414-6415). Additionally, Applicants respectfully request reconsideration of the rejection of claim 122, also previously found allowable, under 35 U.S.C. §103 as being unpatenable over Weinberg et al. (U.S. Pat. 6,030,917) and Johnson et al. (J. Am. Chem. Soc., **1995**, 117(23), pp. 6414-6415), in view of Murata et al. (U.S. Pat. 5,892,075).

In the interests of brevity, Applicants will not restate all of the comments previously submitted in their Amendment D (filed December 16, 2005). Applicants do, however, maintain all of those comments with respect to the present rejections.

#### **A. The Claimed Subject Matter**

Claim 90, from which all other pending claims depend, is directed to a process for preparing and screening an array of metal-ligand compositions. The process comprises:

preparing an array of metal-ligand compositions in a plurality of discrete reaction vessels contained by or within an integrated structure, wherein the plurality of reaction vessels of the array contain different metal-ligand compositions and said preparing comprises delivering a metal-binding ligand and a dissolved, soluble metal precursor to each of the plurality of reaction vessels of the array which combine to form the metal-ligand composition, wherein said soluble metal precursor comprises a solublizing ligand and formation of one or more of the metal-ligand compositions is accompanied by the displacement of said solublizing ligand;

delivering a polymerization monomer to the metal-ligand compositions in the plurality of reaction vessels of the integrated structure to prepare an array of polymerization mixtures therein, wherein one or more of said polymerization mixtures contains a displaced solublizing ligand resulting from the preparation of said metal-ligand compositions;

subjecting the array of polymerization mixtures in the integrated structure to conditions conducive to the formation of a polymerization reaction product; and

screening said array for a polymerization reaction product, wherein the displaced solublizing ligand reduces the catalytic activity of the metal-ligand composition in the polymerization mixture in the polymerization reaction by less than about 80%.

Accordingly, the process of claim 90 is directed to, in part, the preparation of an array of metal-ligand compositions using a soluble metal precursor that is dissolved, wherein as a result of that preparation a solublizing ligand is displaced therefrom. Notably, the displaced solublizing ligand is present in the subsequently formed polymerization mixture, and reduces the catalytic activity of the metal-ligand

composition in the polymerization mixture in the polymerization screening reaction by less than 80%.

As noted in the present application, the solution-based process of the present invention is advantageous for a number of reasons, such as for example that it enables a screening polymerization reaction to be carried out without the need for a purification step prior thereto (e.g., filtration, washing and/or recrystallization step). Accordingly, by-products, such as a displaced solublizing ligand, resulting from the preparation of the metal-ligand compositions, may be present in the polymerization mixtures that are prepared. (See, e.g., p. 3, lines 6-26; p. 5, line 32 to p. 6, line 9; p. 41, lines 23-27; p. 45, lines 30-35; and, Examples 1-35). The present process is therefore advantageous in that, when present in the polymerization mixture as required by claim 90, the displaced solublizing ligand is sufficiently innocuous such that it reduces the catalytic activity of the metal-ligand composition in the polymerization reaction of interest by less than 80%.

B. Weinberg et al.

Applicants acknowledge that Weinberg et al. disclose a process wherein a ligand is displaced from the metal precursor employed in preparing the product catalyst, or metal-ligand composition. Notably, however, Weinberg et al. make no reference to a polymerization reaction performed in the presence of a displaced solublizing ligand. In fact, the resulting product (i.e., catalyst or metal-ligand composition) is purified prior to carrying out a subsequent reaction, such as a polymerization reaction. (See, e.g., Weinberg et al. at column 42, scheme 9 and related text.)

C. Johnson et al.

Applicants also acknowledge that Johnson et al. disclose a process wherein a ligand is displaced from the metal precursor employed in preparing the product catalyst, or metal-ligand composition. Notably, however, Johnson et al., like Weinberg et al.,

make no reference to a polymerization reaction performed in the presence of a displaced solublizing ligand. Rather, Johnson et al., like Weinberg et al., disclose a process wherein the resulting product (i.e., catalyst or metal-ligand composition) is purified prior to carrying out a subsequent reaction, such as a polymerization reaction. Accordingly, Applicants submit that Johnson et al. arguably teach away from the claimed process.

In this regard, Applicants further submit the Office has misunderstood the underlying details of Scheme 1A and/or Scheme 1B. Applicants therefore call the Office's attention to the following:

(1) Scheme 1A

With respect to Scheme 1A, Johnson et al. state (p. 6414, first column, second paragraph) that the Pd(II) and Ni(II) initiators (or catalyst), denoted by structures 1 and 2 (p. 6414, top of second column), are cationic methyl complexes which incorporate bulky diimine ligands.<sup>1</sup> These initiators are formed by the protonation, or activation, of the palladium and nickel dimethyl precursors, denoted by structures 3 and 4 (p. 6414, top of second column), with the activator,  $\text{H}(\text{OEt}_2)_2^+\text{BAr}'_4^-$ , which is accompanied by the loss of methane.

The underlying details of the methods used to prepare the above-noted precursor compounds, as well as the initiators, are provided in the "Supplementary Material" at the end of the Johnson et al. article. Applicants respectfully submit that none of the details provided herein support a conclusion that either (i) a metal-ligand composition is formed by means of combining a dissolved soluble metal precursor and a metal binding ligand, wherein a solublizing ligand is displaced, and (ii) a polymerization is carried out in the presence of a displaced solublizing ligand. Rather, in all cases, either a dissolved soluble metal precursor is not used, or any solublizing ligand is removed prior to polymerization. For example, Applicants submit the Supplementary Material clearly

indicated that any metal-ligand composition that is formed is subjected to some type of isolation or purification step that one of ordinary skill in the art would recognize as removing any displaced solubilizing ligand, if present. More specifically, the Office's attention is called to the following:

- (a) The palladium and nickel dimethyl precursors, denoted by structures 3 and 4, are analogous to the "metal-ligand compositions" of claim 90. The details of how these precursors, or compositions, are prepared are given on p. 2 of the Supplemental Materials (see the second-through fifth paragraphs). It is to be noted from these details that each preparation involves an isolation (e.g., multiple filtrations and/or drying under vacuum), and/or purification (e.g., recrystallization) step. (See, e.g.: second paragraph, fifth line, wherein it is indicated that the reaction product is filtered twice; third paragraph, fourth line, wherein recrystallization of the reaction product is referenced; fourth paragraph, lines 6-8, wherein multiple filtrations and vacuum drying are referenced; and, fifth paragraph, wherein it is indicated that the same procedure as detailed in the fourth paragraph is utilized.) Applicants respectfully submit that one of ordinary skill in the art would recognize that the chlorine ligand displaced from the Pd atom (paragraphs two and three), or the (acac) ligand displaced from the Ni atom (paragraphs four and five) would be removed by these isolation and/or purification steps.

It is also to be noted that, in preparing each of these complexes, or compositions, a dissolved soluble metal precursor is not used. Specifically, it is to be noted that: in the second paragraph, there is no indication that the metal precursor is dissolved when it is mixed with the ligand; in the third paragraph, it is stated that the complex is prepared in the same way as detailed in the second paragraph; in the fourth paragraph, it is stated that the Ni(acac)<sub>2</sub> and the metal binding diimine ligand are suspended (not dissolved) in Et<sub>2</sub>O, and then subsequently Me<sub>2</sub>Mg is

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<sup>1</sup> It is to be noted that what Johnson et al. refer to as an "initiator" here may alternatively be understood to refer to a "catalyst" or an "activated metal-ligand composition."

added thereto; and, in the fourth paragraph, it is stated that the complex is prepared in the same way as detailed in the third paragraph.

- (b) Once the above-noted complexes, or metal-ligand compositions, were prepared, Johnson et al. provide additional details (see the last paragraph on p. 2 and continuing on to the top of p. 4 of the Supplementary Material) relating to the preparation of the initiator (or activated metal-ligand composition), therefrom. For example, the preparation of the cationic initiator is first discussed beginning at the bottom of p. 2. In this paragraph it is stated that a mixture of  $(\text{ArN}=\text{C}(\text{Me})-\text{C}(\text{Me})=\text{NAr})\text{PdMe}_2$  and the activator,  $\text{H}^+(\text{OEt}_2)_2\text{BAF}^-$ , is formed and then, following the addition of  $\text{Et}_2\text{O}$  and mixing at room temperature for a period of time, the solution is filtered and the solvent is removed under vacuum to obtain the resulting  $[(\text{ArN}=\text{C}(\text{Me})-\text{C}(\text{Me})=\text{NAr})\text{Pd}(\text{Me})(\text{OEt}_2)]^+\text{BAF}^-$ . Applicants respectfully submit that one of ordinary skill in the art would recognize that any methane formed during the process would be removed by filtration and vacuum drying.
- (c) The remainder of p. 3 and the first two lines of p. 4 provide details relating to the preparation of three additional cationic initiators (i.e.,  $[(\text{ArN}=\text{C}(\text{H})-\text{C}(\text{H})=\text{NAr})\text{Pd}(\text{Me})(\text{OEt}_2)]^+\text{BAF}^-$ ,  $[(\text{ArN}=\text{C}(\text{Me})-\text{C}(\text{Me})=\text{NAr})\text{Ni}(\text{Me})(\text{OEt}_2)]^+\text{BAF}^-$ , and  $[(\text{ArN}=\text{C}(\text{H})-\text{C}(\text{H})=\text{NAr})\text{Ni}(\text{Me})(\text{OEt}_2)]^+\text{BAF}^-$ ). It is to be noted that, for all three of these initiators, it is specifically stated that the above-noted procedure was used to prepare them. Accordingly, the preparation of these three initiators also involved a filtration and vacuum drying step, which means any methane formed would have been removed.
- (d) Only after the above-noted cationic initiators have been prepared and isolated, were they then subjected to additional tests wherein they were used in various reactions, including the NMR experiments, wherein the initiators were reacted with ethylene or propylene (see the last paragraph on p. 4 to near the bottom of p. 7), and polymerization experiments, wherein the initiators were used to

polymerize ethylene, propylene or hexene monomers (see the last two paragraphs on p. 7 to hear the bottom of p. 8). It is to be noted that, although Johnson et al. provide a very detailed description of these reactions, no reference is made to a reactant, or component present in the reaction mixture, other than the cationic initiator, the monomer, and a solvent (in the case of the NMR experiments, see particularly the details provided in the last paragraph on p. 4, and in the case of the polymerization experiments, see the last three lines at the bottom of p. 7 and the first four lines at the top of p. 8, as well as the third and fourth full paragraphs on p. 8); that is, Johnson et al. provide a very detailed description of these reactions, and no reference is made to the presence of a displaced solubilizing ligand of any kind in the reaction mixture.

(2) Scheme 1B

With respect to Scheme 1B, it is to be noted that Johnson et al. state (p. 6414, last 2 lines of first column and first four lines of second column) that the Ni(II) initiator, denoted by structure 2 (p. 6414, top of second column), may also be generated *in situ* by methylaluminoxane (MAO) activation of the diimine nickel dibromide complex, or metal-ligand composition, denoted by structure 5 (p. 6414, top of second column), in the presence of an olefin monomer.

The underlying details of the methods used in the *in situ* preparation of the above-noted initiator are also provided in the "Supplementary Material" at the end of the Johnson et al. article. Applicants respectfully submit that none of the details provided herein support the conclusion that a polymerization is carried out in the presence of a displaced solubilizing ligand. In fact, the Office appears to acknowledge this fact in the present action, wherein the Office states (see the last sentence of the fourth paragraph on p. 5 of the present Office action):

In the second synthetic scheme the metal catalyst, i.e. the metal with diimine ligands and bromine groups, is activated with an activator (refers

to **without displacing the solublizing ligand**) and exposing the metal catalyst to ethylene (refers to a monomer) that results in a polymer, and the polymer is analyzed by NMR, . . . (emphasis added)

However, in the event Applicants have misinterpreted the Office's admission here, Applicants submit that, in all cases, the diimine nickel dibromide complex, or metal-ligand composition, is prepared and then subjected to some type of isolation or purification step that one of ordinary skill in the art would recognize as removing any displace solublizing ligand, if present. For example, the Office's attention is called to the following:

- (a) The second full paragraph on p. 4 of the Supplementary Material, wherein preparation of the first diimine nickel dibromide complex, or metal-ligand composition, is discussed, it is stated that the diimine ligand was dissolved in  $\text{CH}_2\text{Cl}_2$ . This solution was then added to a suspension of the  $(\text{DME})\text{NiBr}_2$  compound in  $\text{CH}_2\text{Cl}_2$ . The resulting mixture was stirred for a given period of time, then the solvent was evaporated under vacuum. The resulting product was washed repeatedly with hexane, and then once again dried under vacuum.

Accordingly, it is to be noted that a dissolved soluble metal precursor (i.e., the  $(\text{DME})\text{NiBr}_2$  compound) is not combined with the metal-binding ligand here. Furthermore, Applicants respectfully submit that one of ordinary skill in the art would recognize that DME, which is displaced from the nickel by the diimine ligand, is removed by washing and vacuum drying.

- (b) The third and fourth paragraphs of p. 4 provide details for the preparation of other diimine nickel dibromide complexes, or metal-ligand compositions. It is to be noted that, for both complexes, it is specifically stated that the above-noted procedure was used to prepare them. Accordingly, the preparation of these two complexes also fails to involve the use of a dissolved soluble metal precursor.



Furthermore, these preparations clearly involve a washing and vacuum drying step, which means any displaced DME would have been removed.

- (c) The fifth and sixth full paragraphs on p. 4 provide details for the preparation of other diimine nickel dibromide complexes, or metal-ligand compositions. Here, solid diimine ligand and solid (DME)NiBr<sub>2</sub> were combined and then CH<sub>2</sub>Cl<sub>2</sub> was added. The resulting mixture was stirred for a given period of time, then the solvent was evaporated under vacuum. The resulting product was then washed repeatedly with CH<sub>2</sub>Cl<sub>2</sub>, and then once again dried under vacuum.

Accordingly, it is to be noted that a dissolved soluble metal precursor (i.e., the (DME)NiBr<sub>2</sub> compound) is not combined with the metal-binding ligand here. Furthermore, Applicants respectfully submit that one of ordinary skill in the art would recognize that DME, which is displaced from the nickel by the diimine ligand, is removed by washing and vacuum drying.

- (d) It is only after the above-noted complexes, or metal-ligand compositions, have been prepared and isolated, that they were then used in a polymerization reaction. More specifically, after the above-noted isolation, the resulting diimine nickel dibromide complexes, or metal-ligand compositions, were mixed with a monomer and then an activator. As a result, clearly the displaced DME solubilizing ligand is not present. (See the polymerization details beginning near at the top of p. 9 and continuing to the top of p. 10 of the Supplementary Material.)

D. Conclusion In View of Weinberg et al. and Johnson et al.

In view of the foregoing, Applicants respectfully submit the Office has failed to establish a *prima facie* case of obviousness because, at a minimum, (i) the cited references fail to disclose or suggest all of the claim limitations, and/or (ii) the Office has failed to provide a convincing line of reasoning to support that there is some suggestion

or motivation, either in the reference itself or in the knowledge generally available to one of ordinary skill in the art, to modify the teachings of Weinberg et al. and Johnson et al., alone or further in view of Murata et al., in order to obtain the process of any of the presently rejected claims.

Specifically, contrary to the Office's assertion that the cited prior art discloses subject matter identical to that being claimed here, Applicants submit both references fail to disclose or suggest a process wherein a displaced ligand is present in a subsequently formed reaction mixture (e.g., polymerization reaction mixture), and in fact arguably teach away from such a process. As such, both references also fail to disclose or suggest such a process wherein a displaced ligand, present in a polymerization reaction mixture, reduces the catalytic activity in the polymerization screening reaction by less than 80%. It is therefore respectfully submitted that the Office has failed to establish a *prima facie* case of obviousness, because the combination of Weinberg et al. with Johnson et al. fail to disclose or suggest all of the limitations of claim 90.

Applicants additionally submit that the Office has failed to establish a *prima facie* case of obviousness because the Office has failed to provide a convincing line of reasoning to support that there is some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the teachings of Weinberg et al. and/or Johnson et al., in order to obtain the process of claim 90. Applicants respectfully submit there is simply no motivation for one of ordinary skill in the art to modify the processes disclosed in Weinberg et al. or Johnson et al., in order to obtain a process for preparing and screening an array of metal-ligand compositions in a polymerization reaction, wherein a polymerization reaction mixture formed therein contains a displaced solublizing ligand, and further wherein that displaced solublizing ligand reduces the catalytic activity of the metal-ligand composition in the polymerization reaction of interest by less than 80%. There is no such motivation because Weinberg et al. and Johnson et al. both disclose processes wherein the resulting metal-ligand composition, or catalyst, is purified prior to

a subsequent reaction. Applicants therefore submit it is only through impermissible hindsight, in view of the present application, that one of ordinary skill in the art would be motivated to modify the processes of Weinberg et al. and Johnson et al. to obtain a process wherein a polymerization reaction mixture is formed in the presence of a displaced solublizing ligand, and further wherein the displaced solublizing ligand reduces the catalytic activity in the polymerization screening reaction by less than 80%.

E. Conclusion In View of Weinberg et al., Johnson et al. and Murata et al.

With respect to claim 122, Applicants submit the addition of Murata et al. does nothing to address the failures of the Weinberg et al. and Johnson et al. disclosures. Specifically, Murata et al. fail to disclose or suggest a process for preparing an array of metal-ligand compositions using a soluble metal precursor that is dissolved, wherein as a result of that preparation a solublizing ligand is displaced therefrom, and further wherein (i) the displaced solublizing ligand is present in a subsequently formed polymerization mixture, and (ii) the displaced solublizing ligand reduces the catalytic activity of the metal-ligand composition in the polymerization mixture, in a polymerization screening reaction, by less than 80%. Rather, Murata et al., similar to Johnson et al., is focused on the preparation of metal-ligand compositions which, after purification, may be used in a subsequent polymerization reaction. (See, e.g., the Examples in Murata et al., wherein every compound prepared therein is isolated and/or purified in some manner, prior to being used in a subsequent reaction.)

**CONCLUSION**

In view of the foregoing, Applicants respectfully submit claim 90, as well as claims 91-95, 98-102, 106, 107, 113, 114, 116-119 and 122 depending therefrom, are patentable over the cited combination of references. Reconsideration of the rejection of these claims, as well as all pending claims, is therefore respectfully requested.

The Commissioner is hereby authorized to charge any fee deficiency in connection with this Letter (in payment of a two-month extension of time fee for the filing of this Letter, as well as a Request for Continued Examination being submitted simultaneously herewith) to Deposit Account Number 19-1345 in the name of Senniger, Powers, Leavitt & Roedel.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Derick Allen", written in a cursive style.

Derick E. Allen, Reg. No. 43,468  
SENNIGER POWERS  
One Metropolitan Square, 16th Floor  
St. Louis, Missouri 63102  
(314) 231-5400

DEA/lrw